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PROVISIONAL STANDARDS OF RADIATION SAFETY OF FLIGHT PERSONNEL AND PASSENGERS IN AIR TRANSPORT OF THE CIVIL AVIATION

USSR Ministry of Health

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16. Abstract

The provisional standards for radiation are extended to cover all Civil Aviation aircraft transporting passengers and cargo at altitudes above 12,000 meters. The introductory section defines terms and designates agencies responsible for seeing that the regulations are enforced. Section 2 discusses radiation sources and defines types of radiation. Section 3 gives standard levels of permissible radiation and Section 4 discusses conditions for radiation safety. Section 5 covers dosimetric equipment on board aircraft and the last section gives effective dates.

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PROVISIONAL STANDARDS OF RADIATION SAFETY OF FLIGHT PERSONNEL AND PASSENGERS IN AIR TRANSPORT OF THE CIVIL AVIATION

USSR Ministry of Health

1. Introductory Section /3*

1.1. Intention and field of use.

1.1.1. The present standards are extended to all transportation air equipment of the Ministry of Civil Aviation intended for transporting passengers and cargo at altitudes exceeding 12,000 meters.

Notation: The natural background of external radiation at altitudes up to 12,000 m creates an annual equivalent dose of not more than 0.5 rem with flight not exceeding 1000 hours per year.

1.1.2. Provisional standards of radiation safety for flight personnel and passengers in air transportation and civil aviation (VNRBGA-75 [Vremennyye normy radiatsionnoy bezopasnosti grazhdanskoy aviatsii, Provisional standards of radiation safety for civil aviation]) regulate the effect on flight personnel and passengers of all radiation factors which occur during flights.

1.1.3. Present standards are used for the following categories of exposed persons:

flight personnel;

passengers.

1.1.4. Materials of the National Commission on Radiation Protection MZ SSSR [Ministerstvo zdravookhraneniya SSSR, Ministry of Public Health of the USSR] are the basis for existing provisional standards. The following sources were used when developing the VNRBGA-75:

a) Materials of the International Commission on Radiation Protection (MKRZ [Mezhdunarodnaya komissiay po radiatsionnoy

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*Numbers in the margin indicate pagination in the foreign text.

zashchite, International Commission on Radiation Protection]):

--publication 9, 21, 22;

--recommendations "Radiation effect during flights of extremely high aircraft."

b) Materials of the International Organization of Civil Aviation (IKAO [Internatsional'naya kosmicheskaya aviatsionnaya organizatsiya, International Space Aviation Organization]):

--recommendations of the 5th conference of a group of experts on operation of super-high transport equipment (STS [Sverkhvysotnoye transportnoye sredstvo, super-high transport equipment]) on the question of cosmic radiation (points 1 and 2 of the adgenda).

c) "Act on flight and ground studies in order to develop forecasts and estimates of radiation conditions on routes and high flights of STS." GosNIIGA [Gosudarstvennyy nauchno-issledovatel'skiy institut grazhdanskoy aviatsii, State Scientific Research Institute of Civil Aviation], Moscow, 1974. /4

d) "Radiation safety with flight of high aircraft" Ye. Ye. Kovalov, B.M. Petrov, Zh. Kosmicheskaya biologiya i aviakosmicheskaya meditsina 9/2, 54-59 (1975).

e) System of standards of work safety. GOST [Gosudarstvennyy obshchesoyuznyy standart, All-Union State Standard] 12.0.001--74, 12.0.002--74, 12.0.003--74.

1.1.5. The responsibility for carrying out existing standards belongs to the administration and officials of the Ministry of Civil Aviation and the administrations, enterprises and subdivisions under its jurisdiction.

1.2. Basic concepts, terms and definitions.

1.2.1. Ionizing radiation--is any radiation whose interaction with the medium results in the formation of electric charges with different signs.

Notation: a) ultraviolet radiation and visible light are not categorized as ionizing radiation; b) in the future, the

shortened form of the term will be used, radiation.

1.2.2. Gamma-radiation--is electromagnetic (background) radiation with a discrete spectrum emitted during nuclear transformations or during annihilation of particles.

1.2.3. Corpuscular radiation--is ionizing radiation consisting of particles (electrons, protons, neutrons, alpha-particles, etc.).

1.2.4. Linear transfer of the energy of charged particles in a medium (LPE [Lineynaya peredacha energii, Linear transfer of energy])--is average energy $d\bar{E}$ lost by particles in a medium due to collision with a transfer of energy less than Δ eV for a small segment of the path dl divided into this segment:

A kilo electron-volt on a micron of water, 1 keV/μm = 62.5 joule/m is used as the unit of LPE measurement.

1.2.5. Absorption of the D dose--is the average energy dE transmitted by radiation through a substance in a small element of volume divided for the mass of the substance dm in this volume

$$D = \frac{d\bar{E}}{dm}$$

1.2.6. Rad--is the special unit of absorbed dose. /5

1 rad = 100 erg/g = 1.10^{-2} joule/kg

1.2.7. The power of absorbed dose P--is the increment of absorbed dose dD for a small time interval dt divided for this interval

$$P = \frac{dD}{dt}$$

The rad per second, 1 rad/s, is the special unit of power of the absorbed dose.

1.2.8. Equivalent dose H--is the product of the absorbed dose D and the mean coefficient of radiation quality KK [Koeffitsient

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kachestva, Coefficient of quality] at a given point on the skin:

$$H = D \cdot \overline{KK} = D_1 (KK)_1 + D_2 (KK)_2 + D_3 (KK)_3 + \ldots = \int_0^{\infty} D(L_\infty) KK(L_\infty) dL_\infty$$

where indices 1, 2, 3--apply to the component of radiation with different quality:

$$D_1 + D_2 + D_3 + \ldots = D$$

$D(L_\infty)$--distrubution of dose according to full LPE

$KK(L_\infty)$--regulated dependence of the coefficient of quality on full LPE.

Notation: a) the dimensionless coefficient of quality KK is defined as the dependence of undesirable biological consequences of exposure by Man in small doses on the full LPE radiation. Regulater dependence KK (L_∞ is shown in Table 1.1).

TABLE 1.1.

keV/μm of water	3.5	7.0	23	53	175
KK	1	2	5	10	20

b)

c) the power of an equivalent dose is defined similarly to the power of an absorbed dose (term 1.2.7).

1.2.9. Rem--is a special unit of an equivalent dose. /6

$$1 \text{ rem} = \frac{100 \text{ erg/g}}{KK} = \frac{1 \cdot 10^{-2} \text{ joule/kg}}{KK}$$

1.2.10. External exposure--is the effect on the organism of ionizing radiation from radiation sources external in relation to it.

1.2.11. Natural background radiation--is ionizing radiation consisting of cosmic radiation and radiation of naturally distributed natural radiating substances (on the Earth's surface,

in the Earth's atmosphere, in food products, water, in the organism of Man, etc.).

1.2.12. The source of radiation--is a substance or installation emitting or capable of emitting ionizing radiation.

1.2.13. Flight personnel--persons whose participation in flight is a professional activity.

1.2.14. Passengers--are persons participating in flights and who are not flight personnel.

1.2.15. Radiation safety--is the exclusion of somatic effects on flight personnel and passengers subjected to radiation influence, and the limitation of the danger of postponed somatic-stochastic and genetic consequences of a socially acceptable level.

1.2.16. Conditions of radiation safety--is the observance of standardized levels:

--maximally permissible doses for flight personnel;

--dosage maximums for passengers.

1.2.17. Standard level--is the annual dose of maximum of radiation effect.

1.2.18. Expert radiation safety--is the complex of measures directed at establishing the expediency of expected levels of radiation effect with fixed conditions of operation of air transport in civil aviation by standard level.

1.2.19. Maximally permissible dose PDD [Predel'no dopustimaya doza, Maximum permissible dose]--is the largest size of individual equivalent dose per year which, with uniform effect for the period of occupational activity does not cause undesirable changes detected by appropriate methods in healthy personnel.

1.2.20. Maximum dose PD [Predel dozy, Maximum dose]--is the maximum individual equivalent dose per year for passengers (a limited part of the population). The maximum dose is established /7

below the maximum permissible dose in order to prevent unfounded exposure for this contingent of people.

1.2.21. Operating control level--is the size of equivalent dose established for operating control of radiation conditions in order to warn personnel of possible worsening of it.

1.2.22. Level of adoption of measures--is the size of equivalent dose at which it is necessary to take measures directed at preventing breakdown in radiation safety conditions.

1.2.23. Standard of flight time--is maximum annual flight which is permitted in flight divisions or in planning flights for crews of various types of aircraft.

1.2.24. Flight altitude--is relative barometric altitude calculated from the level of an isobaric surface corresponding to standard atmospheric pressure of 760 mm mercury column (1013 mb), generated for flights of airships and divided into established intervals.

2. Brief Characteristics of the Radiation Effect of Cosmic Radiation During Flights on Air Transportation in Civil Aviation

2.1. Basic radiation sources.

2.1.1. Galactic cosmic radiation (GKI [Galakticheskoye kosmicheskoye izlucheniye, Galactic cosmic radiation]) is a constantly acting source. It consists basically of protons and alpha particles. Heavier contaminating particles up to iron nuclei also make up galactic cosmic radiation.

2.1.2. Solar cosmic radiation (SKI [Solnechnoye kosmicheskoye izlucheniye, Solar cosmic radiation]) is generated during chromospheric flares on the Sun and consists basically of protons. This source is of a random character.

2.2. Peculiarities of radiation effects.

The peculiarities of radiation effects during flights on

air transport equipment of civil aviation is due to the physical characteristics of radiation and the conditions of conducting flights.

The level of effect of galactic cosmic radiation and solar cosmic radiation in the atmosphere is determined by two basic processes: penetration of primary radiation at flight altitudes and the formation in the atmosphere of secondary radiation due /8 to the interaction of galactic cosmic radiation and solar cosmic radiation with the nuclei of oxygen and nitrogen. Secondary radiation has a complex character (neutrons, protons, mesons, electrons, gamma radiation). The neutrons which have high penetrating capability and make a significant contribution to the equivalent dose are the most significant radiation component.

The constantly acting source (galactic cosmic radiation) causes a gradual increase in the natural radiation background with an increase in altitude above sea level to 20--24 km where one observes a maximum level of secondary radiation. With a further increase in altitude up to 30--35 km, the radiation background drops somewhat and approaches a level of radiation of cosmic space around the Earth. The maximum size of an equivalent dose from galactic cosmic radiation in the atmosphere amounts to about 2 millirem/hr.

The maximum level of solar cosmic radiation is observed on the boundary of the atmosphere and decreases with an increase in the thickness because the process of weakening primary radiation predominates over the process of accumulation of secondary radiation.

A peculiarity of the radiation effect is also the broad relationship of the radiation level (particularly the solar cosmic radiation) caused by a geomagnetic field: the level of radiation in the region of the equator is several times lower that that at higher latitudes.

The peculiarities indicated result in the fact that at flight altitudes of aircraft, the radiation effect basically is caused by radiation with high penetrating capability.

3. Standard Levels of Radiation Effect

3.1. The category of personnel subject to the radiation effect.

3.1.1. According to standard levels the following categories of personnel are established who can be subject to radiation effect during flight on civil aviation aircraft:

--flight personnel;

--passengers.

3.2. Standard levels.

3.2.1. For the categories of personnel indicated, the following standard levels are established: /9

--maximum permissible dose for flight personnel;

--dose maximum for passengers.

3.2.2. A size of maximally permissible dose equal to 5 rem per year is established as the standard level for flight personnel. A maximum size dose equal to 0.5 rem per year is established as the standard level for passengers.

The indicated values of standard levels apply to the uniform volume of exposure of the body.

Notation: For women in their reproductive years (less than 40 years old) an additional limiting radiation effect has been established for this category of flight personnel: the equivalent dose in the pelvic region must not exceed 1 rem for any 2 months.

4. Providing Conditions for Radiation Safety

4.1. During the radiation effect of galactic cosmic radiation and in the absence of solar cosmic radiation, the condition of radiation safety during flight of civil aviation aircraft is provided both for flight personnel and for passengers.

4.2. The radiation effect of solar cosmic radiation can lead to a breakdown in radiation safety conditions during flight of civil aviation aircraft both in relation to flight personnel and passengers.

4.3. For providing conditions of radiation safety during flights of civil aviation aircraft it is necessary:

to predict levels of radiation effect of solar cosmic radiation for personnel and passengers;

to carry out radiation control with equipment on board the aircraft;

to carry out measures directed at decreasing the levels of radiation effect for flight personnel and passengers.

Notation: Safety conditions for transporting radiation substances are regulated by "Rules of Safety when Transporting Radioactive Substances PBTRV-73."

4.4. Predicting levels of radiation effect of solar cosmic radiation is carried out by forces of All-Union Service of Radiation Safety on the basis of information on geophysical phenomena and on radiation conditions in cosmic space around the Earth. /10

4.5. Radiation control on board the aircraft is accomplished in order to:

--determine the size of an equivalent dose of radiation effect for the flight period;

--obtain operative information on radiation conditions onboard the aircraft during flight.

4.6. Measures directed at decreasing the level of radiation for flight personnel and passengers are carried out according to the prediction results and the radiation control on board.

4.7. In a case of breakdown of radiation safety conditions for flight personnel, the level of radiation effect of not more than two maximally permissible doses must be compensated in such

a way that in the subsequent period, not exceeding 5 years, the accumulated equivalent dose must not exceed the size determined by the formula:

$$N = PDD \cdot T$$

where N--is the equivalent dose of radiation accumulated for the time from the beginning of professional activity, rem;

PDD--is the maximum permissible dose, rem per year;

T--is the period from the beginning of professional activity, years.

With the level of radiation effect not more than 5 PDD, the radiation effect must be so compensated that in the subsequent period, not to exceed 10 years, the accumulated equivalent dose would not exceed the size determined by the formula indicated above.

4.8. With a single radiation effect in a dose of more than 5 PDD, the flight personnel must be sent for medical observation. Flight personnel subjected to such a radiation effect can decide to continue regular work only in the absence of medical contraindications when the following conditions are fulfilled:

$$H \leq PDD \cdot T$$

5. Radiation Control On Board the Aircraft /11

5.1. When making a flight, control of equivalent dose of radiation and the total equivalent dose of radiation effect on flight personnel for the flight must be carried out on board.

5.2. For operative control of the radiation condition in order to warn flight personnel as to possible worsening, an operating control level of the equivalent dose of radiation is introduced. This size of operating control level for aircraft in civil aviation is established at 10 millirems/hr. When the indicated level is reached, the post of the Administration of Air Traffic Control (UVD [Upravleniye vozdushnym dvizheniyem, Air traffic control]) is informed in order to isolate dangerous

altitudes for a possible decrease.

5.3. For operative control of radiation conditions in order to prevent a breakdown in the conditions of radiation safety, a level of equivalent dose of radiation is introduced for adopting measures (level of adoption measures). At this size of equivalent dose, the commander of the aircraft must take measures directed at providing conditions for radiation safety for the flight personnel and passengers (drop to a lower altitude or other measures). The size of the level for adopting measures for civil aviation aircraft is established at 50 millirem/hr.

Troublesome measures directed at providing conditions for radiation safety are acceptable only when there is necessity for preventing accidents and death to persons.

5.4. For flight personnel in a case where the radiation level can exceed 0.3 annually, the maximally permissible dose, that is, that exceeding 1.5 rem per year, individual dosimetric control is obligatory. If the level of radiation effect, according to the data of physical measurements, does not exceed 0.3 annually of the maximally permissible dose, then individual control is not obligatory. In this case, control of the equivalent dose of radiation is maintained and an evaluation of individual doses is made according to this data.

5.5. The results of all types of radiation control on board the aircraft are recorded. When carrying out individual dosimetric control of flight personnel it is necessary to calculate the equivalent dose per year and also for the entire period of professional activity. /12

5.6. If necessary, the level of radiation effect on passengers of the aircraft for a flight is determined according to readings of the dosimetric equipment on board.

5.7. Onboard dosimetric equipment must provide for defining values of the equivalent dose in units of rem/hr (millirem/hr)

according to the following components of radiation:

--contaminated particles;

--neutrons;

--gamma-radiation;

and also indications (signals) of the level of equivalent doses equal to 10 millirems/hr and 50 millirems/hr.

5.8. Under the effect of radiation of mixed composition with known content of separate components, the size of the equivalent dose is determined as the total of sizes of equivalent dose of separate components.

5.9. When determining the equivalent dose of different types of ionizing radiation with unknown spectral components, the coefficient of quality KK is used whose sizes are presented in Table 5.1. For radiation with a known spectral composition, when determining an equivalent dose, one must use the data presented in Tables 5.2--5.6.

TABLE 5.1. COEFFICIENT OF QUALITY OF DIFFERENT TYPES OF RADIATION

Type of radiation	KK	Type of radiation	KK
Roentgen and gamma radiation	1	Neutrons with energy less than 20 keV	3
Electrons and positrons, beta radiation	1	Neutrons with energy of 0.1--10 MeV	10
Protons with energy less than 10 MeV	10	Alpha-radiation with energy less than 10 MeV	20
		Heavy nuclei of emission	20

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TABLE 5.2. DOSE CHARACTERISTICS OF MONOENERGITIC NEUTRONS /13

Energy of neutrons E, MeV	Specific maximum equivalent dose, rem · cm²/neutron	Coefficient of quality, KK
Thermal	$1,0 \times 10^{-9}$	2,8
$1 \times 10^{[illegible]}$	$1,0 \times 10^{-9}$	2,8
$1 \times 10^{[illegible]}$; $1.10^{[illegible]}$	$2,1 \times 10^{-9}$	2,8
$5 \times 10^{[illegible]}$	$1,6 \times 10^{-9}$	2,5
$2 \times 10^{[illegible]}$	$1,7 \times 10^{-9}$	2,7
$1 \times 10^{[illegible]}$	$8,6 \times 10^{[illegible]}$	9,0
$5 \times 10^{[illegible]}$	$5,0 \times 10^{-8}$	12
$1 \times 10^{[illegible]}$	$4,1 \times 10^{-8}$	12
$2,5 \times 10^{[illegible]}$	$5,0 \times 10^{-8}$	10
$5 \times 10^{[illegible]}$	$5,1 \times 10^{-8}$	8,4
1×10^{1}	$5,0 \times 10^{-8}$	6,7
2×10^{1}	$6,3 \times 10^{-8}$	8,0
1×10^{2}	$5,0 \times 10^{-8}$	4,0
5×10^{2}	$6,2 \times 10^{-8}$	3,0
$1 \times 10^{[illegible]}$	$1,2 \times 10^{-7}$	2,5
$1 \times 10^{[illegible]}$	$3,3 \times 10^{[illegible]}$	2,5
$1 \times 10^{[illegible]}$	$6,0 \times 10^{[illegible]}$	2,5
$1 \times 10^{[illegible]}$	$8,5 \times 10^{[illegible]}$	2,5

[Commas in the tabulated material of Table 5.2 are equivalent to decimal points].

Energy of protons, MeV	Specific maximum equivalent dose, rem · cm²/proton	Coefficient of quality, KK
2 × 10[illegible]	1,7 × 10[illegible]	13,5
4 × 10[illegible]	1 × 10[illegible]	11,7
1 × 10[illegible]	6 × 10[illegible]	9,4
2×10^{1}	4,5 × 10[illegible]	7,0
5×10^{1}	8,5 × 10^{-6}	4,7
1 × 10[illegible]	2,5 × 10^{-6}	3,4
2 × 10[illegible]	3,0 × 10^{-7}	2,4
5 × 10[illegible]	1,2 × 10[illegible]	2,1
1 × 10[illegible]	1,4 × 10[illegible]	2,1
3×10^{3}	2,5 × 10[illegible]	2,2
1 × 10[illegible]	3,7 × 10^{-7}	2,3
3 × 10[illegible]	1,9 × 10[illegible]	2,3
1 × 10[illegible]	6,3 × 10[illegible]	2,4
5 × 10[illegible]	7,5 × 10^{-7}	2,4
1 × 10[illegible]	8,8 × 10^{-7}	2,3

[Commas in the tabulated material of Table 5.3 are equivalent to decimal points].

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TABLE 5.4. DENSITY OF FLOW OF HEAVY NUCLEI WHICH CREATE AN EQUIVALENT DOSE OF 2.5 MILLIREM/HR, PARTICLES/CM^2 X S /14

Nucleus / Energy of nuclei, MeV/nucleon	$^{4}_{2}He$	$^{9}_{4}Be$	$^{14}_{7}N$	$^{28}_{14}Si$	$^{56}_{26}Fe$
2×10^{0}	9.2×10^{-4}	3.5×10^{-4}	—	—	—
5×10^{0}	1.2×10^{-3}	3.8×10^{-4}	1.7×10^{-4}	8.7×10^{-5}	—
1×10^{1}	2.0×10^{-3}	4.5×10^{-4}	2.1×10^{-4}	9.7×10^{-5}	5.0×10^{-5}
2×10^{1}	3.7×10^{-3}	6.2×10^{-4}	2.4×10^{-4}	1.0×10^{-4}	5.0×10^{-5}
5×10^{1}	1.1×10^{-2}	1.2×10^{-3}	3.7×10^{-4}	1.1×10^{-4}	5.2×10^{-5}
1×10^{2}	3.2×10^{-2}	2.5×10^{-3}	6.5×10^{-4}	1.6×10^{-4}	6.0×10^{-5}
2×10^{2}	8.0×10^{-2}	8.5×10^{-3}	1.9×10^{-3}	2.5×10^{-4}	7.7×10^{-5}
5×10^{2}	—	5.7×10^{-1}	2.0×10^{-3}	7.0×10^{-4}	2.2×10^{-4}
1×10^{3}	—	5.7×10^{-1}	1.3×10^{-1}	1.1×10^{-2}	4.5×10^{-4}
2×10^{3}	—	4.7×10^{-1}	1.5×10^{-1}	1.2×10^{-2}	1.7×10^{-3}
5×10^{3}	—	3.5×10^{-1}	1.5×10^{-1}	1.2×10^{-2}	2.0×10^{-3}
1×10^{4}	—	2.5×10^{-1}	1.4×10^{-1}	1.2×10^{-2}	1.7×10^{-3}

[Commas in the tabulated material are equivalent to decimal points].

TABLE 5.5. DOSE CHARACTERISTICS OF MONOENERGETIC π-MESONS /15

Energy of π-mesons, MeV	Specific maximum equivalent dose, rem · cm²/meson.		Coefficient of quality, KK	
	π +	π −	π +	π −
1×10^1	$3{,}0 \times 10^{-7}$	$6{,}8 \times 10^{-6}$	1,2	9,1
2×10^1	$2{,}9 \times 10^{-7}$	$6{,}8 \times 10^{-6}$	1,1	10,2
5×10^1	$2{,}6 \times 10^{-7}$	$6{,}0 \times 10^{-6}$	1,2	10,5
1×10^2	$3{,}0 \times 10^{-7}$	—	2,0	5,0
2×10^2	$1{,}6 \times 10^{-7}$	$1{,}8 \times 10^{-7}$	2,2	3,0
5×10^2	$1{,}6 \times 10^{-7}$	$1{,}6 \times 10^{-7}$	2,3	2,6
1×10^3	$1{,}9 \times 10^{-7}$	$1{,}9 \times 10^{-7}$	2,3	2,4
2×10^3	$2{,}0 \times 10^{-7}$	$2{,}0 \times 10^{-7}$	2,3	2,3
1×10^4	$3{,}2 \times 10^{-7}$			
2×10^4	$3{,}5 \times 10^{-7}$			
5×10^4	$4{,}2 \times 10^{-7}$			
1×10^5	$4{,}8 \times 10^{-7}$			
2×10^5	$5{,}2 \times 10^{-7}$			
5×10^5	$6{,}0 \times 10^{-7}$			
1×10^6	$7{,}0 \times 10^{-7}$			
2×10^6	$7{,}8 \times 10^{-7}$			
5×10^6	$9{,}6 \times 10^{-7}$			

[Commas in the tabulated material of Table 5.5. are equivalent to decimal points].

TABLE 5.6. DOSE CHARACTERISTICS OF MONOENERGETIC MU-MESONS

Energy of mu-mesons, MeV	Specific maximum equivalent dose, rem · cm²/mu-meson
6×10^2	$3{,}3 \times 10^{-8}$
1×10^3	$3{,}6 \times 10^{-8}$
2×10^3	$3{,}6 \times 10^{-8}$
5×10^3	$3{,}7 \times 10^{-8}$
1×10^4	$3{,}8 \times 10^{-8}$
2×10^4	$3{,}8 \times 10^{-8}$
5×10^4	$4{,}0 \times 10^{-8}$
1×10^5	$4{,}2 \times 10^{-8}$
2×10^5	$4{,}6 \times 10^{-8}$
5×10^5	$6{,}0 \times 10^{-8}$
1×10^6	$9{,}5 \times 10^{-8}$

[Commas in the tabulated material of Table 5.6. are equivalent to decimal points].

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6. Concluding Section /16

6.1. Time period for carrying out.

The existing standards of radiation safety for flight personnel and passengers of aircraft and civil aviation were introduced on 1/1/1976.

6.2. Effective time period.

Existing standards of radiation safety were adopted for an effective time period from 1/1/1976 to 1/1/1979 with subsequent changes for the permanently effective standards.